

WHAT IS CLAIMED IS:

- 1                   1.     A method for converting a signal to differing sample rates,  
2     comprising:  
3                   receiving, at a first sample rate, a plurality of data points, associated  
4     with a first signal;  
5                   operating on said plurality of data points to associate said signal with a  
6     predetermined set of parameters, with said set of parameters including a first  
7     transition band having an image corresponding thereto; and  
8                   varying said sample rate associated with said first signal by  
9     interpolation with an interpolator having associated therewith a second transition  
10    band, with the width associated with said second transition band being a function of  
11    a spectral separation of said first transition band and said image, wherein a second  
12    signal is produced having a sequence of data samples approximating the first signal.
- 1                   2.     The method recited in claim 1 wherein varying said sample rate  
2     includes producing each data sample associated with said second signal by  
3     convolving a predetermined finite number  $N$  of data points with an equal number of  
4     coefficients, with  $N$  being greater than two.
- 1                   3.     The method recited in claim 2 wherein coefficients vary as a  
2     function of the temporal spacing between the output point and the corresponding  
3     input points.
- 1                   4.     The method as recited in claim 1 wherein varying said sample  
2     rate increases said sample rate.

1                   5.     The method as recited in claim 1 wherein varying said sample  
2     rate decreases said sample rate.

1                   6.     The method as recited in claim 1 wherein operating on said  
2     plurality of data points includes up-sampling said plurality of data points by a factor  
3     of two.

1                   7.     The method as recited in claim 1 wherein operating on said  
2     plurality of data points includes filtering said plurality of data points with a half-  
3     band filter.

1                   8.     The method as recited in claim 1 wherein operating on said  
2     plurality of data points includes decimating said plurality of data points with a half-  
3     band decimator.

1                   9.     The method as recited in claim 6 further including decimating a  
2     plurality of data points output by said interpolator with a half-band decimator, with  
3     varying said sample rate occurring after receiving said plurality of data points and  
4     before decimating said plurality of data points.

1                   10.    The method as recited in claim 1 wherein operating on said  
2     plurality of data points to associate said signal includes filtering the same with a  
3     finite impulse response filter.

1                   11.    The method as recited in claim 1 wherein operating on said  
2     plurality of data points to associate said signal includes filtering the same with an  
3     infinite impulse response filter.

1                   12.    A method for converting a digital audio signal to a different  
2   sample rate, comprising:  
3                   receiving a plurality of data points, associated with an audio signal, at  
4   an initial sample rate;  
5                   halfband filtering said plurality of data points with a halfband filter;  
6   and  
7                   interpolating with an interpolator having independently  
8   programmable parameters.

1                   13.    The method as recited in claim 12 wherein:  
2                   said halfband filtering is done in conjunction with upsampling said  
3   plurality of data points; and  
4                   said interpolating follows said upsampling and halfband filtering.

1                   14.    The method as recited in claim 12 wherein:  
2                   said halfband filtering is done, without upsampling, on said plurality  
3   of datapoints; and  
4                   said interpolating follows said halfband filtering.

1                   15.    The method as recited in claim 12 wherein:  
2                   said halfband filtering follows said interpolating.

1                   16.    The method as recited in claim 12 wherein:  
2                   said halfband filtering is done in conjunction with upsampling said  
3   plurality of data points;

4                   said interpolating follows said halfband filtering; and  
5                   halfband filtering and decimating following said interpolating.

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1                   17.     A computer program product for converting signals to differing  
2 sample rates comprising:

3                   code for receiving a plurality of data points, associated with a signal, at  
4 a first sample rate;

5                   code for operating on said plurality of data points to associate said  
6 signal with a predetermined set of parameters, with said set of parameters including  
7 a first transition band having a first width;

8                   code for varying said sample rate associated with said first signal by  
9 interpolating a subset of data points of said plurality of data points with an  
10 interpolator having associated therewith a second transition band, with the width  
11 associated with said second transition band being a function of a spectral separation  
12 of said first transition band and said image, wherein a second signal is produced  
13 having a sequence of data samples approximating the first signal; and  
14                   a computer-readable storage medium for storing code.

1                   18.     The computer program product as recited in claim 17 wherein  
2 code for operating on said plurality of data points includes code for up-sampling  
3 said plurality of data points by a factor of two.

1                   19.     The computer program product as recited in claim 17 wherein  
2 code for operating on said plurality of data points includes code for filtering said  
3 plurality of data points with a half-band filter.

1                   20.    The computer program product as recited in claim 17 wherein  
2   code for operating on said plurality of data points includes code for decimating said  
3   plurality of data points with a half-band decimator.

1                   21.    The computer program product as recited in claim 18 further  
2   including code for decimating said plurality of data points with a half-band  
3   decimator.

1                   22.    The computer program product as recited in claim 17 wherein  
2   code for operating on said plurality of data points to associate said signal includes  
3   code for filtering said data points with a filter selected from the set of filters  
4   consisting essentially of a finite impulse response filter and a infinite impulse  
5   response filter.

1                   23.    A computer program product for converting a digital audio  
2   signal to a different sample rate, comprising:  
3                   a computer-readable storage medium for storing code, said code  
4   including  
5                   code for receiving a plurality of data points, associated with an audio  
6   signal, at an initial sample rate;  
7                   code for halfband filtering said plurality of data points with a halfband  
8   filter; and  
9                   code for interpolating with an interpolator having independently  
10   programmable parameters.

1                   24.    The computer program product as recited in claim 23 wherein:  
2                   said code for halfband filtering is executable in conjunction with code  
3 for upsampling said plurality of data points; and  
4                   said code for interpolating is executable following said upsampling  
5 and halfband filtering code.

1                   25.    The computer program product as recited in claim 23 wherein:  
2                   said code for halfband filtering is executable, without upsampling  
3 code, on said plurality of datapoints; and  
4                   said code for interpolating is executable following said halfband  
5 filtering code.

1                   26.    The computer program product as recited in claim 23 wherein:  
2                   said code for halfband filtering is executable following said code for  
3 interpolating.

1                   27.    The computer program product as recited in claim 23 wherein:  
2                   said code for halfband filtering is executable in conjunction with code  
3 for upsampling said plurality of data points;  
4                   said code for interpolating is executable following said code for  
5 halfband filtering; and further comprising:  
6                   code for halfband filtering and decimating executable following said  
7 code for interpolating.

1                   28.    The method of claims 1 or 12 wherein said interpolator is an FIR  
2 Nth order sum of products interpolator with linear interpolation of coefficients.

1                   29.    The computer program product of claims 17 or 23 wherein said  
2   interpolator is an FIR Nth order sum of products interpolator with linear  
3   interpolation of coefficients.

1                   30.    The method of claims 1 or 12 wherein said interpolator has a  
2   transition band beginning adjacent the top of a passband and ending adjacent the  
3   bottom of a passband image.

1                   31.    The computer program product of claims 17 or 23 wherein said  
2   interpolator has a transition band beginning adjacent the top of a passband and  
3   ending adjacent the bottom of a passband image.

1                   32.    The method of claims 7, 8, 9 or 12 wherein said halfband filter is  
2   an IIR filter composed of first order allpass blocks.

1                   33.    The computer program product of claims 19 or 23 wherein said  
2   halfband filter is an IIR filter composed of first order allpass blocks.

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